

Notice of Allowability

Application No.

09/834,308

Examiner

Brian L. Mutschler

Applicant(s)

ZAIDI, SALEEM H.

Art Unit

1753

eb

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Amendment filed January 13, 2004, and the interview conducted March 11, 2004.
2. ☒ The allowed claim(s) is/are 1, 2 and 4-24.
3. ☒ The drawings filed on 11 April 2001 are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material

5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date 20040311.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

EXAMINER'S AMENDMENT

1. An extension of time under 37 CFR 1.136(a) is required in order to make an examiner's amendment which places this application in condition for allowance. During a telephone conversation conducted on March 11, 2004, Mr. Samuel Freund requested an extension of time for 1 MONTH(S) and authorized the Director to charge Deposit Account No. 50-1491 the required fee of \$55 for this extension and authorized the following examiner's amendment. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

2. The application has been amended as follows:

In the claims:

a. Please replace claim 1 with the following:

Claim 1: A method for increasing absorption of light radiation incident on a surface of a crystalline silicon photo responsive device which comprises the step of forming a grating on the surface of said photo responsive device upon which the light is incident such that a majority of the incident light entering said photo responsive device couples into diffraction orders which propagate at angles greater than 42°.

- b. Please cancel claim 3. (The limitations of claim 3 are incorporated in claim 1, as indicated in the non-entered amendment filed January 13, 2004.)
- c. Please replace claim 15 with the following:

Claim 15: A method for producing a crystalline silicon solar cell having increased absorption of light radiation incident on a surface thereof which comprises the steps of: (a) forming a grating on the surface of said solar cell upon which the light is incident such that a majority of the incident light entering said photo responsive device couples into diffraction orders which propagate at angles greater than 42° ; (b) removing surface contamination; (c) forming an n-type junction using gas source doping; and (d) forming n- and p-electrical contacts.

- d. Please replace claim 20 with the following:

Claim 20: A method for producing a crystalline silicon solar cell having increased absorption of light radiation incident on a surface thereof which comprises the steps of: (a) forming a grating on the surface of said solar cell upon which the light is incident such that a majority of the incident light entering said photo responsive device couples into diffraction orders which

propagate at angles greater than 42° ; (b) cleaning the surface to remove surface contamination; (c) forming an n-type junction by ion implantation; (d) annealing the solar cell formed thereby; and (e) forming n- and p-electrical contacts.

3. The following is an examiner's statement of reasons for allowance:

The instant invention is distinguished over the prior art of record by providing a method of increasing the amount of light absorbed close to the light-incident surface of a photo-responsive device through the use of a grating having a period capable of coupling a majority of incident light into diffraction orders propagating at an angle greater than 42° . Czubytyj et al. teach a photovoltaic device having a diffraction grating that can be formed on the light-incident surface. However, Czubytyj et al. neither teach nor suggest the formation of a grating to couple incident light into diffraction orders propagating at an angle greater than 42° . The intent of Czubytyj et al. is to increase total internal reflection, while the benefits of the instant invention include an improvement of light absorption using a diffraction grating on the front surface without affecting the surface passivation of the device. Czubytyj et al. teach the preferred formation of a diffraction grating at the side opposite the light incident surface, which does not confer the same benefits as the instant invention. As indicated in the disclosure, the prior art teaches away from the use of front surface gratings because of surface passivation issues (see page 3, lines 1-2). Therefore, the instant invention is

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distinguished over the prior art of record by requiring light to be coupled into diffraction orders propagating at an angle greater than 42°.


Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

4. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian L. Mutschler whose telephone number is (571) 272-1341. The examiner can normally be reached on Monday-Friday from 7:30am to 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

blm
March 12, 2004


NAM NGUYEN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700